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The Modeling of the Absorbance of Sub-THz Radiation by Human Skin

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Noa Betzalel ; Yuri Feldman ; Paul Ben Ishai

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Abstract:

In the near future, applications will come online that require data transmission in ultrahigh rates of 100 Gbit per second and beyond. In fact, the planning for new industry regulations for the exploitation of the sub-THz band are well advanced under the auspices of IEEE 802.15 Terahertz Interest Group. One aspect of this endeavor is to gauge the possible impact on human health by the expected explosion in commercial use of this band. It is, therefore, imperative to estimate the respective specific absorption rates of human tissues. In the interaction of microwave radiation and human beings, the skin is traditionally considered as just an absorbing sponge stratum filled with water. This approach is justified when the impinging wavelength is greater than the dimensions of the skin layer. However, in the sub-THz band this condition is violated. In 2008, we demonstrated that the coiled portion of the sweat duct in upper skin layer could be regarded as a helical antenna in the sub-THz band. The full ramifications of what these findings represent in the human condition are still very unclear, but it is obvious that the absorption of electromagnetic energy is governed by the topology for the skin and its organelles, especially the sweat duct.

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Authors

Noa Betzalel

Department of Applied Physics, The Hebrew University of Jerusalem

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